IN THE CLAIMS

Listing of Claims:

1.   (Previously Presented) A method for controlling a switch comprising:

a number of input ports, each receiving data cells on a respective link;

a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue;

a flow control means for pausing and un-pausing senders on selected links; the method including the steps of:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links FM=AS-LE;

if the free margin sinks below a threshold AS-LE < A, then a selected link is paused; and

if the free margin thereafter raises above a threshold AS-LE> B, then a selected paused link is un-paused.

2.   (Original) A method according to claim 1, wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link.

3.   (Original) A method according to claim 2, wherein the content LE of the links is estimated as the sum of the contents of all the input links.

4.   (Original) A method according to claim 3, wherein the estimation of the content LE of the links takes into account the different link lengths and bit rates.

5.   (Currently Amended) A method according to claim 4, wherein each link estimate is based on a model of the ~~behaviour~~ behavior of each port.

6.   (Original) A method according to claim 5, wherein the model consists of a curve having different segments, each segment reflecting a specific state of the port.

7.   (Original) A method according to claim 6, wherein the states include:

a state in which the link is full and contains a maximum amount of data;

a state in which the port is to be paused and is waiting for a pause frame to be sent and in which the link remains at the maximum amount for a fixed duration or until the pause frame is sent;

a state in which a pause frame is sent and the port is waiting for a fixed duration to allow a packet to leave the sender, and in which the link remains at the maximum amount;

a state in which the pause frame has reached the sender and the link content is decreased linearly with time to a minimum amount;

a state in which the port is to be un-paused and is waiting for an un-pause frame to be sent and in which the link remains constant for a fixed duration; and

a state in which an un-pause frame is sent and the link content is increased linearly with time to the maximum amount.

8.   (Original) A method according to claim 7, wherein the maximum amount of data equals twice as much as a round trip content plus two full-sized packets.

9.   (Original) A method according to claim 7, wherein the minimum amount of data equals one full-sized packet.

10.   (Original) A method according to claim 7, wherein the slopes of the linear increase and decrease depend on the bit rate of the respective link.

11.   (Original) A method according to claim 2, wherein the most offending sender is paused first.

12.   (Original) A method according to claim 2, wherein the least offending sender is un-paused first.

13.   (Original) A method according to claim 11 or 12, wherein offending senders are detected by means of an overflow sum counter OFS.

14.   (Original) A method according to claim 13, wherein a counter OFS is associated with each input port, and is increased each time the input port sends a packet to a congested output port.

15.   (Original) A method according to claim 14, wherein the counter OFS of each input port is increased with the packet length, each time the input port sends a packet to a congested output port.

16.   (Original) A method according to claim 14, wherein the counter OFS is reset to zero when its associated input port receives an un-pause frame

17.   (Original) A method according to claim 14, wherein an output port is considered congested if the queue length thereof exceeds a threshold.

18.   (Previously Presented) A method for controlling a switch comprising: a number of input ports, each receiving data cells on a respective link; a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue; a flow control means for pausing and un-pausing senders on selected links; the method including the steps of:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links $FM=AS-LE$;

if the free margin sinks below a threshold $AS-LE < A$, then a selected link is paused;

if the free margin thereafter raises above a threshold $AS-LE > B$, then a selected paused link is un-paused;

wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link;

wherein the most offending sender is paused first or wherein the least offending sender is un-paused first;

wherein offending senders are detected by means of an overflow sum counter OFS;

wherein a counter OFS is associated with each input port, and is increased each time the input port sends a packet to a congested output port; and

wherein an output port is considered congested if the queue length thereof exceeds a threshold; and

wherein the queue length threshold equals a maximum length packet.

19.   (Previously Presented) A method for controlling a switch comprising: a number of input ports, each receiving data cells on a respective link; a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue; a flow control means for pausing and un-pausing senders on selected links; the method including the steps of:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links FM=AS-LE;

if the free margin sinks below a threshold AS-LE < A, then a selected link is paused;

if the free margin thereafter raises above a threshold AS-LE> B, then a selected paused link is un-paused;

wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link;

wherein the most offending sender is paused first or wherein the least offending sender is un-paused first;

wherein offending senders are detected by means of an overflow sum counter OFS, and

wherein a maximum value is defined for the OFS counters, and when one counter reaches this maximum, all counters are divided by 2.

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20.   (Previously Presented) A method for controlling a switch comprising: a number of input ports, each receiving data cells on a respective link; a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue; a flow control means for pausing and un-pausing senders on selected links; the method including the steps of:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links FM=AS-LE;

if the free margin sinks below a threshold AS-LE < A, then a selected link is paused;

if the free margin thereafter raises above a threshold AS-LE> B, then a selected paused link is un-paused

if the free margin thereafter raises above a threshold AS-LE> B, then a selected paused link is un-paused;

wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link;

wherein the most offending sender is paused first or wherein the least offending sender is un-paused first;

wherein offending senders are detected by means of an overflow sum counter OFS; and

wherein a maximum value is defined for the OFS counters, and when one counter reaches this maximum, the value of the smallest counter is subtracted from all the counters.

21.   (Original) A method according to claim 13, wherein all the OFS counters are decreased linearly with time.

22.   (Original) A method according to claim 1, wherein the threshold A is set to zero (A = 0).

23.   (Original) A method according to claim 1, wherein the threshold A is set to a negative value (A < 0).

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24.   (Currently Amended) A method according to claim 1, wherein the threshold A is less than or equal to the threshold B $(A \rightarrow B)$ $(A \leq B)$.

25.   (Original) A switch comprising:

a number of input ports, each receiving data cells on a respective link;

a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue;

a flow control means for pausing and un-pausing senders on selected links; the switch further including means for:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links FM=AS-LE;

wherein the flow control means is arranged to pause a selected link, if the free margin sinks below a threshold AS-LE < A; and to un-pause a selected paused link, if the free margin thereafter raises above a threshold AS-LE > B.

26.   (Original) A switch according to claim 25, wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link.

27.   (Original) A switch according to claim 26, wherein the content LE of the links is estimated as the sum of the contents of all the input links.

28.   (Original) A switch according to claim 27, wherein the estimation of the content LE of the links takes into account the different link lengths and bit rates.

29.   (Currently Amended) A switch according to claim 28, wherein each ~~link~~ link estimate is based on a model of the ~~behaviour~~ behavior of each port.

30.   (Original) A switch according to claim 29, wherein the model consists of a curve having different segments, each segment reflecting a specific state of the port.

31.   (Original) A switch according to claim 30, wherein the states include:
a state in which the link is full and contains a maximum amount of data;
a state in which the port is to be paused and is waiting for a pause frame to be sent and in which the link remains at the maximum amount for a fixed duration or until the pause frame is sent;
a state in which a pause frame is sent and the port is waiting for a fixed duration to allow a packet to leave the sender, and in which the link remains at the maximum amount;
a state in which the pause frame has reached the sender and the link content is decreased linearly with time to a minimum amount;
a state in which the port is to be un-paused and is waiting for an un-pause frame to be sent and in which the link remains constant for a fixed duration; and
a state in which an un-pause frame is sent and the link content is increased linearly with time to the maximum amount.

32.   (Original) A switch according to claim 31, wherein the maximum amount of data equals twice as much as a round trip content plus two full-sized packets.

33.   (Original) A switch according to claim 31, wherein the minimum amount of data equals one full-sized packet.

34.   (Original) A switch according to claim 31, wherein the slopes of the linear increase and decrease depend on the bit rate of the respective link.

35.   (Original) A switch according to claim 26, wherein the flow control means is arranged to pause the most offending sender first.

36.   (Original) A switch according to claim 26, wherein the flow control means is arranged to un-pause the least offending sender first.

37.   (Original) A switch according to claim 35 or 36, wherein the flow control means contain an overflow sum counter OFS to detect offending senders.

38.   (Original) A switch according to claim 37, wherein a counter OFS is associated with each input port, and is increased each time the input port sends a packet to a congested output port.

39.   (Original) A switch according to claim 38, wherein the counter OFS of each input port is increased with the packet length, each time the input port sends a packet to a congested output port.

40.   (Original) A switch according to claim 38, wherein the counter OFS is reset to zero when its associated input port receives an un-pause frame

41.   (Original) A switch according to claim 38, wherein an output port is considered congested if the queue length thereof exceeds a threshold.

42.   (Previously Presented) A switch comprising:
        a number of input ports, each receiving data cells on a respective link;
        a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue;
        a flow control means for pausing and un-pausing senders on selected links; the switch further including means for:
        monitoring the remaining available buffer space AS of the shared buffer;
        estimating the expected total content LE of the links;
        calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links FM=AS-LE;
        wherein the flow control means is arranged to pause a selected link, if the free margin sinks below a threshold AS-LE < A; and to un-pause a selected paused link, if the free margin thereafter raises above a threshold AS-LE > B;

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wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link;

wherein the flow control means is arranged to pause the most offending sender first; or wherein the flow control means is arranged to un-pause the least offending sender first;

wherein the flow control means contain an overflow sum counter OFS to detect offending senders;

wherein a counter OFS is associated with each input port, and is increased each time the input port sends a packet to a congested output port;

wherein an output port is considered congested if the queue length thereof exceeds a threshold; and

wherein the queue length threshold equals a maximum length packet.

43.   (Previously Presented) A switch comprising:

a number of input ports, each receiving data cells on a respective link;

a number of output ports sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue;

a flow control means for pausing and un-pausing senders on selected links, the switch further including means for:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links $FM=AS-LE$;

wherein the flow control means is arranged to pause a selected link, if the free margin sinks below a threshold $AS-LE < A$; and to un-pause a selected paused link, if the free margin thereafter raises above a threshold $AS-LE > B$;

wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link;

wherein the flow control means is arranged to pause the most offending sender first, or wherein the flow control means is arranged to un-pause the least offending sender first;

wherein the flow control means contain an overflow sum counter OFS to detect offending senders; and

wherein a maximum value is defined for the OFS counters, and when one counter reaches this maximum, all counters are divided by 2.

44.   (Previously Presented) A switch comprising:

a number of input ports, each receiving data cells on a respective link,

a number of output orts sharing a buffer space in which each output port can reserve space for an output queue, wherein incoming data cells are switched to an appropriate output queue;

a flow control means for pausing and un-pausing senders on selected links; the switch further including means for:

monitoring the remaining available buffer space AS of the shared buffer;

estimating the expected total content LE of the links;

calculating a free margin (FM) as the remaining available buffer space minus the expected total content of the links FM=AS-LE;

wherein the flow control means is arranged to pause a selected link, if the free margin sinks below a threshold AS-LE < A; and to un-pause a selected paused link, if the free margin thereafter raises above a threshold AS-LE > B;

wherein the flow control means comprises a pause frame generator for generating pause frames to be sent to data senders in order to pause senders on a selected link, and generating un-pause frames to be sent to data senders in order to un-pause senders on a selected paused link;

wherein the flow control means is arranged to pause the most offending sender first; or wherein the flow control means is arranged to un-pause the least offending sender first

wherein the flow control means contain an overflow sum counter OFS to detect offending senders; and

wherein a maximum value is defined for the OFS counters, and when one counter reaches this maximum, the value of the smallest counter is subtracted from all the counters.

45.   (Original) A switch according to claim 37, wherein all the OFS counters are decreased linearly with time.

46.   (Original) A switch according to claim 25, wherein the threshold A is set to zero (A = 0).

47.   (Original) A switch according to claim 25, wherein the threshold A is set to a negative value (A < 0).

48.   (Original) A switch according to claim 25, wherein the threshold A is less than or equal to the threshold B (A ≤ B).